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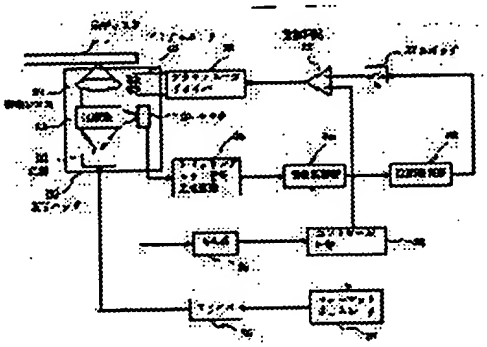
(54) OPTICAL INFORMATION RECORDING MEDIUM, INFORMATION RECORDING AND REPRODUCING DEVICE AND INFORMATION RECORDING METHOD

(57)Abstract:
PROBLEM TO BE SOLVED: To perform formatting by optical recording of the same method as data recording of an optical disk composing tracks of a land part and a groove part, to prevent the generation of crosstalk and to facilitate information management.
SOLUTION: A control circuit 28 moves an optical head 25 to the innermost peripheral track of an optical disk 1, instructs the start of processing of a land to a format generator 27, the land part is formatted from the innermost periphery to the outermost periphery and a track address is imparted. Next, the optical head 25 is moved to the innermost peripheral track, the groove part is formatted from the innermost periphery to the outermost periphery and a track address is imparted. Consequently, the track address with continuous number is formed in the land and the groove and information management is facilitated. Since this is the method without forming a rugged pit, the influence of crosstalk is not generated.



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CLAIMS

[Claim(s)]
[Claim 1] It is the information record regenerative apparatus which performs informational record playback to the disk-like optical information record medium with which a truck is constituted by the land and the groove section which were formed spirally. A preformat signal generation means to output the preformat signal which generated the preformat signal for formatting said land and the groove section, respectively, and was this generated with format initiation directions, respectively, The record reproducing head which records information to the recording surface of said optical information record medium based on the preformat signal outputted from said preformat signal generation means, A location detection means to detect the disk radial location of said record reproducing head, Based on the location detected with said location detection means, each format initiation truck in said land and the groove section is obtained. the information record regenerative apparatus characterized by having the control means into which it is made to format by performing format initiation directions to said preformat signal generation means based on this profit **** format initiation truck.
[Claim 2] In an information record regenerative apparatus according to claim 1, it has further the reversion system which acquires a regenerative signal based on the output of said record reproducing head. A control means About either a land or the groove section It is made to format based on the format initiation truck obtained based on the location detected with the location detection means. About another side The information record regenerative apparatus characterized by obtaining a format initiation truck based on the regenerative signal about this format obtained in said reversion system, and making it format based on this.
[Claim 3] The information record regenerative apparatus characterized by having further a phase simulation means to take the synchronization of the phase of the regenerative signal acquired in a reversion system, and the preformat signal outputted from a preformat signal generation means in an information record regenerative apparatus according to claim 2.
[Claim 4] It is the information record regenerative apparatus which the positional information of the format initiation truck in a land and the groove section is recorded on the predetermined section of an optical information record medium in the information record regenerative apparatus according to claim 2, and is characterized by for a control means obtaining the format initiation truck in a land and the groove section based on the regenerative signal about the positional information of said predetermined section obtained from a reversion system, and making it format based on this.
[Claim 5] The information record regenerative apparatus characterized by having further a phase simulation means to take the synchronization of the phase of FG circuit which generates FG signal which becomes the origin of the revolving speed control of a disk revolution in an information record regenerative apparatus according to claim 1, and a FG signal generated in said FG circuit and the preformat signal outputted from a preformat signal generation means.
[Claim 6] The optical information record medium characterized by being the disk-like optical information record medium with which a truck is constituted by the land and the groove section which were formed spirally, for preformat information being recorded on each truck of said land and the groove section by optical recording, and the track address continuing over a periphery from disk inner circumference.
[Claim 7] It is the optical information record medium characterized by optical recording being a magneto-optic recording in an optical information record medium according to claim 6..
[Claim 8] The optical information record medium characterized by the track address in a land and the track address in the groove section being the same in an optical information record medium according to claim 6.
[Claim 9] The optical information record medium which is an optical information record medium used for an information record regenerative apparatus according to claim 4, and is characterized by recording the positional information of the format initiation truck in a land and the groove section on the predetermined section.
[Claim 10] It is the information record approach performed to the disk-like optical information record medium with which a truck is constituted by the land and the groove section which were formed spirally. The 1st step which records preformat information by using a predetermined truck as a format initiation truck about said land, The 2nd step which reproduces the preformat information recorded at said 1st step, The 3rd step which asks for the format initiation truck of said groove section based on the result reproduced at said 2nd step, The information record approach characterized by having the 4th step which records preformat information about said groove based on the format initiation truck called for at said 3rd step.
[Claim 11] It is the information record approach performed to the disk-like optical information record medium with which a truck is constituted by the land and the groove section which were formed spirally. The 1st step which records preformat information by using a predetermined truck as a format initiation truck about said land, The 2nd step which reproduces the preformat information recorded at said 1st step based on the reference clock of a predetermined frequency, The 3rd step which asks for the format initiation truck of said groove section based on the result reproduced at said 2nd step, The information record approach characterized by having the 4th step which records preformat information based on the reference clock of said predetermined frequency about said groove based on the format initiation truck called for at said 3rd step.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the optical information record medium of the shape of a disk from which a truck is constituted by the land and the groove section which were formed spirally, the information record regenerative apparatus which performs informational record playback to the optical information record medium, and its information record approach.
[0002]
[Description of the Prior Art] When various things are known as a technique which records information and is reproduced optically conventionally and it roughly classifies according to information record and a playback system through them], there are three kinds, a ROM (only for playbacks) mold, a WORM (postscript) mold, and a R/W (rewriting is possible) mold. Each of these media is using glass or a transparent ingredient like a polycarbonate as the substrate, and a class division is carried out by the difference in the ingredient which is applied on this substrate and formed. That is, it will be classified into a R/W mold if the ingredient which will produce a reversible reaction thermally and magnetically like a WORM mold, a magnetic material, or a phase change (crystal and amorphous condition can be taken) ingredient if the ingredient which will cause irreversible reaction with heat like a ROM mold and organic coloring matter if the matter with a high reflection factor and high thermal stability is used like aluminum on a substrate is used is used.
[0003] Moreover, an optical information record medium is roughly classified into a disk mold, a card mold, and a tape mold according to the configuration. Although there are the features in the optical information record medium of each [these] mold, respectively and it is properly used by the application, since the disk mold is excellent in the rapidity of information transfer, it is the most common especially.
[0004] The data recorded on a disk are crossed to a disk hoop direction, are formed succeeding the specified quantity, and, generally call this a truck. In the case of the information record medium of a disk mold, forming concentric circle-wise [data tracks] or spirally is possible, but it is advantageous when the direction which formed the truck spirally from the continuity of data transfer treats the data of a large quantity.
[0005] Drawing 3 is drawing showing an example of the optical information record medium of the disk mold which formed the truck spirally.
[0006] In drawing 3 , the groove whose 100 is a disk and the guide rail by which 103a-103c were spirally formed on the recording surface of a disk 100, and 102a and 102b are the lands formed among groove 103a - 103c.
[0007] In this optical information record medium, the data of a large quantity can be continuously treated by carrying out record playback of the information, making between a groove or a groove (land) into data tracks, and advancing the light beam for information record playback along with data tracks. Recently, the technique called a land / groove record is developed so that the data of a large quantity can be dealt with further. This can be said to the both sides of a land and a groove that it records data, and can double storage capacity by this.
[0008] When performing informational record playback to the both sides of a land/groove as mentioned above, the push pull method of generating a tracking error signal based on the output of each sensor section of 2 division photodetector (or quadrisection photodetector), and performing tracking is used. In this case, a polarity reverses the generated tracking error signal between a land and a groove. For example, if a tracking error signal starts and carries out a zero cross by groove 103a when an optical spot crosses a land and a groove from a disk periphery one by one from groove 103a to groove 103c in the direction of inner circumference, as shown in drawing 4 , the polarity will be reversed as it said that a zero cross was fallen and carried out by part for the core of adjoining land 102a, and a zero cross was further started and carried out by the next groove 103b. Thus, since the polarity of a tracking error signal is reversed in a land and a groove, when carrying out record playback of the information, the truck which carries out record playback changes the polarity of a tracking error signal by the land or the groove, and tracking is performed.
[0009] When recording information from the above-mentioned thing in the optical information record medium shown in drawing 3 For example, after turning off a tracking servo, the polarity of tracking is changed to the polarity of landau. Move an optical head to land 102a, and data are recorded by setting the tracking servo after migration to ON. Then, as the polarity of tracking is changed, it moves an optical head to groove 103b and data are recorded by setting the tracking servo after migration to ON, after turning off a tracking servo It puts from the periphery side (or inner circumference side) of a disk, and information is recorded on a land and a groove by turns. Although information is recorded on a land and a groove by turns, being accompanied by track jump actuation in this record It records without performing track jump actuation in the sequence land 102b and ..., after land 102a so that the continuity of record playback actuation may not be spoiled. if a land part fills -- a groove side -- a polarity -- switching -- groove 103a and groove 103b -- it is also recordable in the sequence ...
[0010]
[Problem(s) to be Solved by the Invention] Usually, the optical disk-like record medium is classified by the sector which divided the information record section per hundreds to several K bytes, and informational record playback is performed for every sector of this. There is the preformat section by which the preformat information that a sector existed, such as a truck location (track address) and a sector location (sector address), was beforehand recorded on each sector, and in case record playback of the information is carried out, it is searched for the sector of the target in the truck made into the object based on the track address and sector address which were recorded on this preformat section. Preformat information, such as a track address recorded on this sector, is the information on that location proper, and from not being rewritten once it is written in, even if it is disks (R/W mold disk) rewritable [even if], it is

usually formed of the phase pit (concavo-convex pit).
[0011] In the optical information record medium with which a truck is constituted by the land and the groove section which were formed spirally as shown in above-mentioned drawing 3 , management of record playback of the information on a disk becomes easy by performing formatting of forming the above-mentioned track address by the number which follows a land and a groove from a periphery [of a disk], or inner circumference side. However, when preformat information is formed of a phase pit as mentioned above, there are the following problems.
[0012] Drawing 5 is drawing showing the condition of having formed preformat information by the phase pit (concavo-convex pit) in the optical information record medium shown in above-mentioned drawing 3 , and the concavo-convex pits 106a and 106b are formed in the both sides of groove 103a and land 102a. Thus, when the concavo-convex pits 106a and 106b are formed in the both sides of groove 103a and land 102a, in case the information on a track address etc. is reproduced using interference of the reflected light from a concavo-convex pit, the cross talk by the phase pit arises between groove 103a and land 102a, and playback may not be performed correctly. Furthermore, when the address information of the concavo-convex pits 106a and 106b differs, it may have an adverse effect also on the tracking servo for making the spot for record playback follow a truck.
[0013] If preformat information is recorded using optical recording, such as a method which replaces with the method which records preformat information by the phase pit, and records user data, and same method, for example, a magneto-optic recording etc., as for the effect of a cross talk and the adverse effect to a tracking servo arising, it is effective to use this technique as the technique of solving the above-mentioned problem from being lost. However, in the optical information record medium shown in drawing 3 , the information record regenerative apparatus in which formatting of forming a track address using optical recording, such as a magneto-optic recording, by the number which follows a land and a groove from a periphery [of a disk] or inner circumference side as mentioned above is possible is unprecedented, and let development of this equipment be a technical problem.
[0014] The object of this invention is to offer the information record regenerative apparatus and the information record approach of forming by the number which continues a track address over a periphery from the inner circumference of a disk by optical recording, such as a magneto-optic recording, to the optical information record medium with which a truck is constituted by the land and the groove section which were formed spirally.
[0015]
[Means for Solving the Problem] The information record regenerative apparatus of this invention is an information record regenerative apparatus which performs informational record playback to the disk-like optical information record medium with which a truck is constituted by the land and the groove section which were formed spirally. A preformat signal generation means to output the preformat signal which generated the preformat signal for formatting said land and the groove section, respectively, and was this generated with format initiation directions, respectively, The record reproducing head which records information to the recording surface of said optical information record medium based on the preformat signal outputted from said preformat signal generation means, A location detection means to detect the disk radial location of said record reproducing head, Based on the location detected with said location detection means, each format initiation truck in said land and the groove section is obtained. it is characterized by having the control means into which it is made to format by performing format initiation directions to said preformat signal generation means based on this profit **** format initiation truck.
[0016] In the above-mentioned information record regenerative apparatus, it has further the reversion system which acquires a regenerative signal based on the output of the record reproducing head. A control means About either a land or the groove section It is made to format based on the format initiation truck obtained based on the location detected with the location detection means. About another side Based on the regenerative signal about this format obtained in said reversion system, you obtain a format initiation truck, and it may be made to format based on this. In this case, you may have further a phase simulation means to take the synchronization of the phase of the regenerative signal acquired in a reversion system, and the preformat signal outputted from a preformat signal generation means. Moreover, the positional information of the format initiation truck in a land and the groove section is recorded on the predetermined section of an optical information record medium, and a control means may be that of ** p into which obtain the format initiation truck in a land and the groove section based on the regenerative signal about the positional information of said predetermined section obtained from a reversion system, and it is made to format based on this.
[0017] Moreover, you may have further a phase simulation means to take the synchronization of the phase of FG circuit which generates FG signal which becomes the origin of the revolving speed control of a disk revolution, and a FG signal generated in said FG circuit and the preformat signal outputted from a preformat signal generation means.
[0018] The optical information record medium of this invention is a disk-like optical information record medium with which a truck is constituted by the land and the groove section which were formed spirally, and preformat information is recorded on each truck of said land and the groove section by optical recording, and it is characterized by the track address continuing over a periphery from disk inner circumference.
[0019] In this case, optical recording may be a magneto-optic recording.
[0020] Furthermore, the track address in a land and the track address in the groove section may be the same.
[0021] Moreover, the optical information record medium of this invention is an optical information record medium used for an above-mentioned information record regenerative apparatus, and is characterized by recording the positional information of the format initiation truck in a land and the groove section on the predetermined section.
[0022] The information record approach of this invention is the information record approach performed to the disk-like optical information record medium with which a truck is constituted by the land and the groove section which were formed spirally. The 1st step which records preformat information by using a predetermined truck as a format initiation truck about said land, The 2nd step which reproduces the preformat information recorded at said 1st step, The 3rd step which asks for the format initiation truck of said groove section based on the result reproduced at said 2nd step, It is characterized by having the 4th step which records preformat information about said groove based on the format initiation truck called for at said 3rd step.
[0023] Moreover, the information record approach of this invention is the information record approach performed to the disk-like optical information record medium with which a truck is constituted by the land and the groove section which were formed spirally. The 1st step which records preformat information by using a predetermined truck as a format initiation truck about said land, The 2nd step which reproduces the preformat information recorded at said 1st step based on the reference clock of a predetermined frequency, The 3rd step which asks for the format initiation truck of said groove section based on the result reproduced at said 2nd step, It is characterized by having the 4th

step which records preformat information based on the reference clock of said predetermined frequency about said groove based on the format initiation truck called for at said 3rd step.
[0024]
[Function] In the information record regenerative apparatus of this invention constituted as mentioned above, since preformat information is formed of for example, a light modulation method or a field modulation technique and a phase pit (concavo-convex pit) is not formed, neither the effect of a cross talk nor the adverse effect to a tracking servo arises. Moreover, in performing a format of a land and the groove section, each format initiation truck can be arranged in this invention. For example, the land and groove of the most inner circumference can be used as a format initiation truck. Therefore, if it formats on certain conditions based on these formats initiation truck, when a format of a land and the groove section is independently performed in consideration of the continuity and rapidity of record playback actuation, a track address can be formed by the number which continues over a periphery from the inner circumference of a disk.
[0025] moreover, about either a land or the groove section among this inventions It is made to format based on the format initiation truck obtained based on the location detected with the location detection means. About another side In the equipment and the approach of obtaining a format initiation truck based on the regenerative signal about this format obtained in said reversion system, and making it format based on this for example, when it is made to format based on the format initiation truck obtained based on the location detected with the location detection means, a land Since the format initiation truck of the groove section is called for based on the preformat information recorded on the land The truck which certainly adjoins the format initiation truck of a land not related at the precision of the seek operation of an optical head can be used as the format initiation truck of a groove.
[0026] Moreover, in what takes the synchronization of the phase of a regenerative signal and a preformat signal, since the synchronization of a phase with the regenerative signal which reproduced the preformat information recorded on the land is taken, the preformat signal generated in the case of a format of the groove section, for example when it is made to format about a land previously can arrange the location of the hoop direction of each sector in a truck.
[0027] Moreover, in that for which the optical information record medium with which the positional information of the format initiation truck in a land and the groove section was recorded on the predetermined section is used, since the format initiation truck in a land and the groove section can be obtained by accessing the predetermined section, the land and the groove of the most inner circumference in the truck with which predetermined certainly adjoins the precision of the seek operation of an optical head not related can be used as the format initiation truck of a land and the groove section, respectively.
[0028] In what takes the synchronization of the phase of the FG signal and the preformat signal which become the origin of the revolving speed control of a disk revolution, since the format in a land and the groove section is performed based on the preformat signal with which all synchronized with this FG signal, the location of the hoop direction of each sector in a truck can be arranged.
[0029]
[Embodiment of the Invention] Next, the example of this invention is explained with reference to a drawing.
[0030] Drawing 1 is the block diagram showing the outline configuration of the information record regenerative apparatus of one example of this invention.
[0031] In drawing 1 , 1 is the optical information record medium shown in drawing 3 . Here, in order to record data on the both sides of a land and a groove, it is constituted so that about 1/2, i.e., the groove, and the land of a groove pitch may serve as the almost same (about 1:1) width of face in the width of face of the groove which is a truck guide rail.
[0032] 21 is an objective lens, counters the recording surface of a disk 1 and is arranged, and that location is controlled by the focus servo circuit and the focal actuator which are not illustrated so that the light by which outgoing radiation was carried out from this objective lens 21 always focuses on the recording surface of a disk 1. 22 is optical system and is equipped with the sensor 24 which changes the light source 23 and pickup light for information record playback into an electrical signal. In this optical system 22, it is condensed by the optical spot of the diameter of predetermined on the recording surface of a disk 1 through the above-mentioned objective lens 21, and that reflected light is again condensed by the sensor through an objective lens 21, and the light injected from the light source 23 is changed into an electrical signal. The optical head 25 is constituted by these objective lenses 21 and optical system 22.
[0033] 34 is AT error signal generation circuit, and generates a tracking error signal based on the electrical signal outputted from the sensor 24 of the above-mentioned optical system 22. In addition, optical system 22 supports tracking methods, such as the well-known push pull method, and generation of the tracking error signal in this AT error signal generation circuit 34 is generated corresponding to the tracking method in that optical system 22. For example, in the case of the push pull method, a tracking error signal is generated based on the output of each sensor section of 2 division photodetector (or quadrisection photodetector).
[0034] 35 is a polar switcher and performs the polar change of the tracking error signal generated in the above-mentioned AT error signal generation circuit 34. This polar switcher 35 is controlled by the control circuit 28 mentioned later.
[0035] 36 is a phase compensator, and to the tracking error signal with which the polarity was changed by the above-mentioned polar switcher 34, in order to stabilize a servo, it performs phase compensation. The output of this phase compensator 36 is one input of an adder circuit 38 through the switch 37. Control of the switch of this switch 37 is performed by the control circuit 28.
[0036] The output line of the above-mentioned phase compensator 36 is connected to one input terminal through a switch 37, as for an adder circuit 38, the output line of a control circuit 28 is connected to the input terminal of another side, and the output is the input of the actuator driver 39. The actuator driver 39 changes into a current signal the signal inputted from an adder circuit 38, and drives the actuator 40 which moves an objective lens 21.
[0037] 27 is a format generator and is a circuit which generates a preformat signal based on preformat information currently beforehand written in ROM etc., such as a track address and a sector address. In this format generator 27, if there are format processing initiation directions from a control circuit 28, the generated preformat signal will be outputted.
[0038] 26 is the driver of the light source 23 and drives the light source 23 based on the preformat signal outputted from the above-mentioned format generator 27.
[0039] 29 is the reversion system which restores to the signal by which photo electric translation was carried out, and

is reproduced by the sensor 24, and the signal to which it restored by this reversion system is inputted into the control circuit 28.
[0040] The control circuit 28 usually contains CPU in the configuration, control turning on and off of a tracking servo, controls migration of an objective lens 21 on a target truck, and also it performs the polar change of the tracking error signal in the polar switcher 35. When carrying out by controlling turning on and off of a switch 37 when controlling turning on and off of a tracking servo and controlling migration of an objective lens 21 on a target truck, the acceleration pulse for moving an objective lens 21 to a target truck, where a switch 37 is turned OFF is generated, and it carries out by outputting this to an adder 38. Moreover, when performing the polar change in the polar switcher 35, based on the location of the code track which is going to carry out record playback actually, it judges whether the truck is a groove and whether it is a land, and the polar change of a tracking error signal is performed. Furthermore, this control circuit 28 performs control of migration of the optical head 25 in the case of formatting, and format processing initiation directions, or checks whether it has been recorded as the information by which the preformat signal recorded based on the recovery signal from a reversion system 29 was recorded on the above-mentioned ROM.

[0041] In the above-mentioned information record regenerative apparatus, the optical head 25 is constituted so that a disk radial location can be detected. The configuration is shown in drawing 2 .
[0042] The scale 30 used as a disk radial scale and the position transducer 31 for detecting the location of the optical head 25 in this scale 30 are formed in the optical head 25. This position transducer 31 is constituted by the linear encoder etc., and that output is inputted into the control circuit 28. When starting format processing of a land and a groove by the control circuit 28 by considering as such a configuration, the disk radial location of the optical head 25 can be obtained from the output of a position transducer 31, and it is possible to move the optical head 25 to a position by this.
[0043] In the information record regenerative apparatus of this example constituted as mentioned above, preformat information, such as a track address and a sector address, is recorded by the same method as the recording method of user data. For example, the magnetic substance is used for information record film, and preformat information is recorded by the recording method of recording as a difference in the sense of magnetization. Therefore, only a truck guide rail is formed on a disk substrate, but in the process of the beginning in case the process of the last of disk production or a user uses a disk, by the method same with recording user data, it crosses all over a disk and record of preformat information is performed.
[0044] Next, the actuation at the time of format processing of this information record regenerative apparatus is explained. The following explanation explains the format processing to the optical information record medium shown in drawing 3 .
[0045] If information is recorded on a land and a groove by turns to the optical information record medium shown in drawing 3 , being accompanied by track jump actuation and polar change, since the continuity of record actuation will be spoiled remarkably, Here, preformat information is recorded, without performing track jump actuation in the sequence land 102b and ..., after land 102a. if record of a land part finishes — a groove side -- a polarity — switching — groove 103a and groove 103b — record of preformat information is performed in the sequence ... Specifically, record of preformat information is performed as follows.
[0046] A control circuit 28 makes a switch 37 off first, and moves the optical head 25 to the truck of the most inner circumference based on the output of a position transducer 31. If the optical head 25 is moved to the truck of the most inner circumference, while making the polarity of the polar switcher 35 into landau continuously and turning ON a switch 37, the format processing initiation about a land is directed to the format generator 27. Then, tracking is performed, the optical head 25 is fixed to the truck of a land, a land is formatted from the most inner circumference to the outermost periphery, and a track address is attached. Here, even addresses are attached like odd addresses, or "2, 4, 6" like "1, 3, 5 .." from the most inner circumference. [..]
[0047] After a format of a land is completed, a control circuit 28 turns OFF a switch 37 again, and moves the optical head 25 to the truck of the most inner circumference based on the output of a position transducer 31. If the optical head 25 is moved to the truck of the most inner circumference, while making the polarity of the polar switcher 35 into a groove side continuously and turning ON a switch 37, the format initiation about a groove is directed to the format generator 27. Then, tracking is performed, the optical head 25 is fixed to the truck of the groove section, the groove section is formatted from the most inner circumference to the outermost periphery, and a track address is attached. Here, if the number of the track addresses of the above-mentioned land is odd and is even number and even so that a truck may serve as an address which continued like "1, 2, 3, 4 .." from the most inner circumference, an address is attached like odd number. Consequently, as shown in drawing 6 , the track address of land 2a, 2b, and 2c is set to "n+2", "n", and "n-2", respectively, and a Grooves [3a 3b, 3c and 3d] track address is set to "n+3", "n+1", "n-1", and "n-3", respectively.
[0048] As mentioned above, with the above-mentioned rec/play student equipment of this example, with the method which records user data, and the same method, formatting of forming a track address by the number which follows a land and a groove from the inner circumference side (or periphery side) of a disk can be performed, and, thereby, informational management becomes easy.
[0049] In addition, although it formatted in above-mentioned formatting so that it might become the address with which each track address of a land and a groove continues from a disk inner circumference side, a track address may be attached, using the adjoining land and groove as 1 set. That is, you may make it the track address of land 2a, groove 3a, land 2b and groove 3b, and land 2c and groove 3c set to "n+1", "n", and "n-1", respectively, as shown in drawing 7 .
[0050] Moreover, in above-mentioned explanation, although the position transducer 31 of the optical head 25 was explained as a linear encoder, it does not interfere at all as a configuration which the role of a position transducer has in moving the optical head 25 to a format starting position from the main point of this invention, and does not need to cross to the total radius location of a disk using a scale, and does not therefore need to detect a location, for example, detects only a format starting position using a photo interrupter. Moreover, not using a special detector, ** also restricts the movable range mechanically in the migration device of the optical head 25, and it is good also considering a spilling limit location as a format starting position.
[0051] <Example 2> In formatting of the above-mentioned example 1, after a format of a land is completed, a control circuit 28 moves the optical head 25 to the truck of the most inner circumference based on the output of a position transducer 31, and is fixing the optical head 25 to the groove near the truck of the most inner circumference by

changing the polar switcher 35 to a groove side. For this reason, if the precision of seek operation is low, it will also be considered that the format initiation truck in a land and the format initiation truck in a groove are not assembled. Here, the example which was made to perform migration to the groove of the most inner circumference of the optical head 25 based on the preformat information recorded on the land as the technique of the ability to arrange certainly the format initiation truck in a land and the format initiation truck in a groove regardless of the precision of seek operation is explained. The land in this case and the procedure of formatting of a groove are shown in drawing 8 . In addition, since it is the configuration same about the configuration of equipment as the configuration of the equipment shown in above-mentioned drawing 1 , the explanation about a configuration is omitted and explains only the procedure of formatting here.

[0052] First, a control circuit 28 moves the optical head 25 to the truck near the most inner circumference based on the output of a position transducer 31, it makes the polar switcher 35 the polarity of landau, makes tracking perform, fixes the optical head 25 to the truck of a land (step S101), and formats about a land (step S102). If a format is performed about a land, the format termination location judges based on the output of a position transducer 31 for whether it is the outermost periphery (step S103), and in not being the outermost periphery, it will return to step S102.

[0053] When a format termination location is judged to be the outermost periphery at the above-mentioned step S103, the optical head 25 is continuously moved to near the most inner circumference (step S104), the preformat information recorded on the land based on the output of a reversion system 29 is reproduced (step S105), and it judges that it is the land a track address indicates the most inner circumference to be (step S106). Here, when it is judged that it is the land with which carry out the track jump of the optical head 25 to an inner circumference side further, and return and a track address indicate the most inner circumference to be to previous (step S107) step S105 when a track address is judged not to be the land which shows the most inner circumference, the following steps S108-S110 are performed.

[0054] When a track address is judged to be the land which shows the most inner circumference at the above-mentioned step S106, a control circuit 28 makes the polar switcher 35 the polarity by the side of a groove, carries out the track jump of the optical head 25 to the groove which adjoins the land (step S108), and formats about the groove section (step S109). If a format is performed about the groove section, the format termination location judges based on the output of a position transducer 31 for whether it is the outermost periphery (step S110), and in not being the outermost periphery, if it is return and the outermost periphery, it will end processing to step S109.

[0055] <Example 3> Although the format initiation truck has been obtained in an above-mentioned example 1 and an above-mentioned example 2 based on the location of the optical head 25 detected with a position transducer 31, it can replace with this, truck starting position information can be formed in the most-inner-circumference location (depending on a revolution of a disk, it is an outermost periphery location) of a disk for example, by the phase pit, and a format initiation truck can also be obtained by detecting this truck starting position information. Below, formatting at the time of forming truck starting position information in the most-inner-circumference location of a disk is explained briefly. In addition, about the configuration of equipment, since it is the configuration of the equipment shown in above-mentioned drawing 1 , and the same configuration, the explanation about a configuration is omitted here.

[0056] Drawing 9 is drawing showing the condition of having formed the truck starting position information 6 in the land of the most-inner-circumference location of the optical information record medium shown in drawing 3 . In this optical information record medium, the truck starting position information 6 is formed in the phase pit (concavo-convex pit).

[0057] When this optical information record medium is used, first, a control circuit 28 makes the polar switcher 35 the polarity of landau, looks for the truck with which the truck starting position information 6 is recorded based on the output (recovery signal) of a reversion system 29, and accesses the land on which the truck starting position information 6 is recorded. And the land is used as a format initiation truck, and the format initiation about a land is directed to the format generator 27.

[0058] After a format of a land is completed, a control circuit 28 looks for the truck with which the truck starting position information 6 is again recorded based on the output (recovery signal) of a reversion system 29, and accesses the land on which the truck starting position information 6 is recorded. And while carrying out the track jump of the optical head 25 to the groove which adjoins the land on which the truck starting position information 6 is recorded, the polar switcher 35 is made into the polarity by the side of a groove, the groove is used as a format initiation truck, and the format initiation about a groove is directed to the format generator 27.

[0059] By formatting as mentioned above, a track address can be formed by the number which follows a land and a groove from the periphery side (or inner circumference side) of a disk, without using position-transducer 31 grade.

[0060] In addition, in above-mentioned explanation, although the truck starting position information 6 is recorded on the land of the most inner circumference, it is not restricted to this, may be replaced with a land, may be recorded on the groove of the most inner circumference, and may be further recorded on the land or groove of the outermost periphery depending on the hand of cut of a disk. Moreover, the truck starting position information 6 may be recorded on 1 set of lands and the groove which the most inner circumference or the outermost periphery adjoins. In this case, in advance of a format of a land and a groove, each truck starting position information 6 is looked for, and the format about a land and a groove is performed by using as a format initiation truck the land and groove on which the truck starting position information 6 was recorded, respectively.

[0061] Moreover, record of the truck starting position information 6 is [that what is necessary is just to be able to specify a format initiation truck] good also as a configuration to which a part of configuration of a guide rail besides a phase pit (concavo-convex pit) was changed.

[0062] Moreover, since the phase pit (concavo-convex pit) formed as above-mentioned truck starting position information 6 is established in one truck (they are two trucks when preparing the both sides of a land and a groove) of the most inner circumference or the outermost periphery for the purpose of acquiring the positional information for finding an initiation truck to the last and it is not prepared in an entire disk, neither the effect of a cross talk nor the adverse effect to a tracking servo poses a problem. In addition, what is necessary is just to make it not use the field which adjoins the part in which for example, the phase pit was established in this case in the truck in which the phase pit was established, and an adjoining truck, although it is also considered that the effect of a cross talk arises.

[0063] <Example 4> Although the above-mentioned examples 1-3 explained the information record regenerative apparatus which can perform formatting of forming a track address by the number which follows a land and a groove from the periphery side (or inner circumference side) of a disk, in order to make truck management easy, it is desirable

for the location of the hoop direction of each sector in a truck to have gathered. Here, the equipment which established the means for arranging the location of the hoop direction of each sector of each truck with the information record regenerative apparatus shown in drawing 1 is explained.
[0064] Drawing 10 is the block diagram showing an example of an information record regenerative apparatus equipped with a means to arrange the location of the hoop direction of each sector of each truck. About the same configuration section as the section shown in drawing 1 , the same sign is attached among drawing.
[0065] In drawing 10 , a spindle motor for 32 to rotate a disk and 33 are FG (frequenncy generator) circuits which generate FG signal which becomes the origin of the revolving speed control of a spindle motor 32. FG signal generated in this FG circuit 33 is inputted into the format generator 27, in order to synchronize preformat information with a revolution of a spindle motor 32 and to record it. Non-illustrated PLL (phase-locked loop) is prepared in the format generator 27, and the synchronization of the phase of FG signal from FG circuit and the preformat signal which is an output signal is taken by this PLL. That is, the reference clock with which FG signal inputted in PLL and the phase synchronized is generated, and the format generator 27 operates based on the generated reference clock.
[0066] If a disk is set and it rotates, while the rotational frequency will be controlled by the information record regenerative apparatus constituted as mentioned above based on FG signal generated in the FG circuit 33, FG signal which has become the origin of the revolving speed control is inputted into the format generator 27, and the reference clock with which FG signal and the phase synchronized in PLL is generated.
[0067] If there are format initiation directions about a land from a control circuit 28 here, the format generator 27 will operate based on the reference clock generated in PLL, and will output the preformat signal with which FG signal and the phase synchronized. If a preformat signal is outputted, a driver 26 will drive the light source 23 (refer to drawing 1) according to the preformat signal, and, thereby, preformat information will be recorded. Similarly, when there are format initiation directions about a land from a control circuit 28, a driver 26 drives the light source 23 (refer to drawing 1) according to the preformat signal with which FG signal and the phase synchronized, and, thereby, preformat information is recorded.
[0068] As mentioned above, since each format in a land and a groove is performed based on the preformat signal with which FG signal which has become the origin of the revolving speed control of a spindle motor 32, and the phase synchronized, the location of the hoop direction of each sector of a land and a groove can be arranged.
[0069] <Example 5> Although it was made to synchronize the phase of the FG signal and the preformat signal which have become the origin of the revolving speed control of a spindle motor 32 in the above-mentioned example 4, the location of the hoop direction of each sector of a land and a groove can also be arranged by the following technique.
[0070] When reproducing the preformat information recorded on the land based on the output of the reversion system 29 of step S105 explained in the example 2 mentioned above, the clock which surely serves as criteria using PLL is made, and signal regeneration is performed synchronizing with the reference clock. Therefore, if it is made to synchronize with the reference clock generated in PLL in the case of this signal regeneration and the groove section is formatted, also in the information record regenerative apparatus shown in drawing 1 , the location of the hoop direction of each sector of a land and a groove can be arranged.
[0071] PLL used by this example is contained in the reversion system 29 shown in drawing 1 , or the format generator 27, and generates the reference clock in the case of playback of the address of a land, and a format of the groove section. This PLL can set up a frequency band comparatively highly, in order to take the synchronization of a phase with a regenerative signal in the case of playback of the address of a land, and it has the composition that a frequency band can be set up low, in the case of a format of the groove section. In this example, it formats in a procedure as shown in the following drawing 11 using this PLL. In addition, since it is the configuration same about the configuration of equipment as the configuration of the equipment shown in above-mentioned drawing 1 , the explanation about a configuration is omitted and explains only the procedure of formatting here.
[0072] First, a control circuit 28 makes the polar switcher 35 the polarity of landau, moves the optical head 25 to the groove of the most inner circumference based on the output of a position transducer 31 (step S201), and formats about a land (step S202). If a format is performed about a land, the format termination location judges based on the output of a position transducer 31 for whether it is the outermost periphery (step S203), and in not being the outermost periphery, it will return to step S202.
[0073] When a format termination location is judged to be the outermost periphery at the above-mentioned step S203, the optical head 25 is continuously moved to near the most inner circumference (step S204), the frequency band of PLL is in the condition set up highly, and the preformat information recorded on the land based on the output of a reversion system 29 is reproduced (step S205). If playback is performed, it will judge that it is the land a track address indicates the most inner circumference to be continuously (step S206). When it is judged that it is the land return and a track address indicate the most inner circumference to be to previous (step S207) step S205 by carrying out the track jump of the optical head 25 to an inner circumference side further when a track address is judged not to be the land which shows the most inner circumference here, while locking PLL in the condition at the time of playback, setting out of a frequency band is made low (step S208), and the following steps S208-S210 are performed. In addition, let setting out of the frequency band of PLL here be the value from which a clock does not separate even if it moves to a contiguity groove.
[0074] If it is low set up so that a clock may not separate even if it is locked by the condition at the time of playback and a frequency band moves PLL to a contiguity groove, a control circuit 28 will make the polar switcher 35 the polarity by the side of a groove, will carry out the track jump of the optical head 25 to the groove which adjoins the land (step S209), and will format about the groove section (step S210). If a format is performed about the groove section, the format termination location judges based on the output of a position transducer 31 for whether it is the outermost periphery (step S211), and in not being the outermost periphery, if it is return and the outermost periphery, it will end processing to step S210.
[0075] The location of the hoop direction of each sector of a land and a groove can be arranged without using a special signal generator like the example 4 mentioned above, if the above technique is used.
[0076] In addition, although the examples 1-5 explained above showed the case of the so-called light modulation record which modulates the reinforcement of the light source according to recording information, the recording method which can also use a magneto-optic disk, and does not modulate the reinforcement of the light source according to information in this case, but modulates an external magnetic field by the magnetic head is used. That is, an external magnetic field is modulated using the preformat signal outputted from the format generator 27 shown in drawing 1 , and the reinforcement of the light source 23 can acquire the same effectiveness as the equipment

mentioned above, if it is made into sufficient magnitude for information record.
[0077] moreover, resolution with a playback light optical about the magneto-optic disk which used the magnetic material by JP,6-124500,A, JP,3-93058,A, and JP,4-255946,A as a technique for large-capacity-izing in recent years -- the super resolution technique of realizing the above recording density is proposed. In the information record regenerative apparatus of this invention, since it is also possible to form preformat information by magnetic recording using a magneto-optic disk, preformat information can also be formed using this super resolution technique. Below, the super resolution technique currently indicated by these official reports is explained briefly.
[0078] (1) Super resolution technical drawing 12 indicated by JP,6-124500,A In drawing for explaining the super resolution technique indicated by above-mentioned JP,6-124500,A (a) is drawing in which playback light shows the temperature distribution in drawing having shown the cross section of the magneto-optic disk in the condition that the recording surface irradiated, in ** type, drawing having shown the disk recording surface of the condition which showed (b) in (a) in ** type, and the condition which showed (c) in (b) and a corresponding truck core.
[0079] The magneto-optic disk is constituted by the substrate 5 constituted by glass or the polycarbonate, the interference layer 54 by which the laminating was carried out one by one to this and the playback layer 51 which is the 1st magnetic layer, the memory layer 52 which is the 2nd magnetic layer, and the protective layer 55 in drawing 12 . The interference layer 54 is for heightening the Kerr effect, and a protective layer 55 is for protecting the magnetic layer of the playback layer 51 and the memory layer 52. The arrow head in the playback layer 51 and the memory layer 52 expresses the sense of the iron-family-elements sub-lattice magnetization in a layer. The memory layer 52 is a big layer of the vertical magnetic anisotropy formed of TbFeCo, DyFeCo, etc., magnetization of this memory layer 52 forms a magnetic domain by facing up or facing down to a film surface, and recording information is held. the playback layer 51 -- an ingredient with a small saturation magnetization [Ms] vertical magnetic anisotropy -- rare-earth-elements sub-lattice magnetization -- it consists of superior presentations. At the room temperature, although the playback layer 51 is the magnetization film within a field, the ingredient which carries out the phenomenon of the saturation magnetization Ms gradually, and serves as perpendicular magnetic anisotropy films bordering on temperature Tth with lifting of temperature is used for it.
[0080] When the light for information playback is irradiated from a substrate 5 side at the magneto-optic disk of the above configurations, the temperature gradient based on data tracks comes to be shown in drawing 12 (c), and when this is seen from a substrate 5 side, the constant-temperature line of temperature Tth will exist in a spot like drawing 12 (b). Then, in the part below temperature Tth, since the playback layer 51 serves as magnetization film within a field, it does not contribute to the Kerr effect (the front mask 64 is formed), but the mask of the record magnetic domain held at the memory layer 52 is carried out, and it disappears.
[0081] On the other hand, in the part beyond temperature Tth, the playback layer 51 serves as perpendicular magnetic anisotropy films, and the sense of iron-family-elements sub-lattice magnetization turns into recording information and the same direction by the switched connection from the memory layer 52. As a result, the record magnetic domain of the memory layer 52 is imprinted by only the part of the small aperture 63 compared with the magnitude of a spot 61, and super resolution is realized.
[0082] (2) Super resolution technical drawing 13 indicated by JP,3-93058,A and JP,4-255946,A In drawing for explaining the super resolution technique indicated by above-mentioned JP,3-93058,A and above-mentioned JP,4-255946,A (a) is drawing in which playback light shows the temperature distribution in drawing having shown the cross section of the magneto-optic disk in the condition that the recording surface irradiated, in ** type, drawing having shown the disk recording surface of the condition which showed (b) in (a) in ** type, and the condition which showed (c) in (b) and a corresponding truck core.
[0083] In drawing 13 , the magneto-optic disk is the thing of the same configuration as the magneto-optic disk shown in above-mentioned drawing 12 , except that the middle class 53 who is the 3rd magnetic layer is formed between the playback layer 51 and the memory layer 52.
[0084] After arranging the sense of magnetization of the playback layer 51 with an one direction by the initialization field (arrow head a) in advance of information playback and carrying out the mask of the magnetic-domain information on the memory layer 52, Irradiate the optical spot 61 and the playback layer 51 is made to maintain an initialization condition in a low-temperature field among the temperature distributions of the medium produced in that case (formation of the front mask 64). The orientation of the playback layer 51 is made to carry out in the direction of a playback field (arrow head b) compulsorily in a with a curie temperature [of an interlayer 53 / Tc] of two or more elevated-temperature field (formation of the rear mask 65). As the magnetic-domain information on the memory layer 52 is imprinted only in a moderate temperature field, activation-magnitude of a playback spot is made small, the record mark 62 below the diffraction limitation of light is made refreshable by this, and improvement in linear density is in drawing.
[0085] With these well-known super resolution technique, since it is extended in the direction of the truck with which the front mask 64 in a low-temperature field adjoins, to aim at improvement in track density to track recording density and coincidence is also tried.
[0086] In the information record regenerative apparatus of this example, by using together an above-mentioned super resolution technique, preformat information can be recorded by the minute mark, the recording density of an entire disk can be raised, and improvement in the further track density can be aimed at. Thereby, a disk with big storage capacity can be offered.
[0087]
[Effect of the Invention] Since this invention is constituted as explained above, effectiveness which is indicated below is done so.
[0088] In a thing according to claim 1, since preformat information is formed of for example, a light modulation method or a field modulation technique, it is effective in the stable address information which neither the effect of a cross talk nor the adverse effect to a tracking servo produces being recordable.
[0089] Furthermore, since a track address can be formed by the number which continues over a periphery from the inner circumference of a disk when a format of a land and the groove section is performed independently, it is effective in management of informational record playback becoming easy.
[0090] In claim 2 and a thing according to claim 4, since the truck which certainly adjoins the precision of the seek operation of an optical head on the format initiation truck of a land not related can be used as the format initiation truck of a groove in addition to each above-mentioned effectiveness, it is effective in the ability to offer a reliable information record regenerative apparatus.

[0091] In claim 3 and a thing according to claim 5, since the location of the hoop direction of each sector in a truck can be arranged in addition to each above-mentioned effectiveness, it is effective in management of informational record playback becoming easy more.
[0092] It sets from claim 6 to a medium according to claim 8, and since the pitch of a truck is not restricted to the magnitude in consideration of the cross talk of the phase pit between trucks, it is effective in the ability to aim at buildup of the storage capacity by improvement in track density. In addition, since a track address can be formed in a land and the groove section by the number which continues over a periphery from the inner circumference of a disk, it is effective in management of informational record playback becoming easy.
[0093] In a medium according to claim 9, it is effective in the ability to use as the format initiation truck of a groove the truck which certainly adjoins the precision of the seek operation of an optical head on the format initiation truck of a land not related.
[0094] In claim 10 and an approach according to claim 11, to the disk-like optical information record medium with which a truck is constituted by the land and the groove section which were formed spirally, when a format of a land and the groove section is independently performed in consideration of the continuity and rapidity of record playback actuation, it is effective in the ability to form a track address by the number which continues over a periphery from the inner circumference of a disk. Among these, in an approach according to claim 11, it is effective in the ability to arrange the location of the hoop direction of each sector in a truck.

[Translation done.]

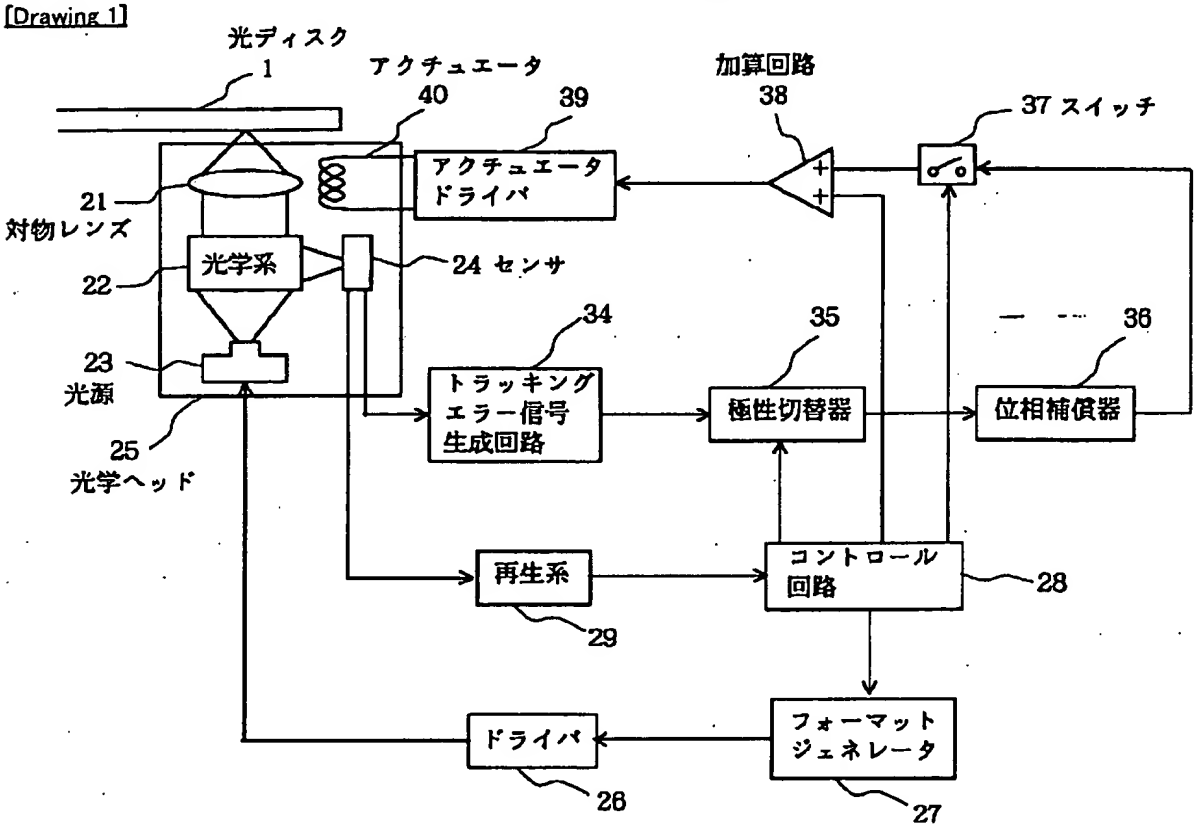
DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram showing the outline configuration of the information record regenerative apparatus of one example of this invention.
[Drawing 2] It is drawing showing an example of the device which detects the disk radial location of the optical head 25 shown in drawing 1 .
[Drawing 3] It is drawing showing an example of the optical information record medium of the disk mold which formed the truck spirally.
[Drawing 4] It is the wave form chart of a tracking error signal when sequential crosses [an optical spot] a land and a groove to the optical information record medium shown in drawing 3 .
[Drawing 5] It is the ** type Fig. showing the condition of having formed preformat information by the phase pit in the optical information record medium shown in drawing 3 .
[Drawing 6] It is drawing showing an example of the track address formed to the optical information record medium shown in drawing 3 .
[Drawing 7] It is drawing showing an example of the track address formed to the optical information record medium shown in drawing 3 .
[Drawing 8] It is the flow chart which shows an example of the procedure of formatting of the land performed in the information record regenerative apparatus shown in drawing 1 , and a groove.
[Drawing 9] It is drawing showing the condition of having prepared truck starting position information in the land of the most-inner-circumference location of the optical information record medium shown in drawing 3 .
[Drawing 10] It is the block diagram showing an example of an information record regenerative apparatus equipped with a means to arrange the location of the hoop direction of each sector of each truck.
[Drawing 11] It is the flow chart which shows an example of the procedure of formatting of the land performed in the information record regenerative apparatus shown in drawing 1 , and a groove.
[Drawing 12] It is drawing for explaining the super-resolution technique indicated by JP,6-124500,A, and (a) is drawing in which playback light shows the temperature distribution in drawing having shown the cross section of the magneto-optic disk in the condition that the recording surface irradiated, in ** type, drawing having shown the disk recording surface of the condition which showed (b) in (a) in ** type, and the condition which showed (c) in (b) and a corresponding truck core.
[Drawing 13] It is drawing for explaining the super-resolution technique indicated by JP,3-93058,A and JP,4-255946,A, and (a) is drawing in which playback light shows the temperature distribution in drawing having shown the cross section of the magneto-optic disk in the condition that the recording surface irradiated, in ** type, drawing having shown the disk recording surface of the condition which showed (b) in (a) in ** type, and the condition which showed (c) in (b) and a corresponding truck core.
[Description of Notations]
1 Optical Disk
6 Truck Starting Position Information
102a, 102b Land
103a, 103b, 103c Groove
21 Objective Lens
22 Optical System
23 Light Source
24 Sensor
25 Optical Head
34 Tracking Error Signal Generation Circuit
35 Polar Switcher
36 Phase Compensator
37 Switch
38 Adder Circuit
39 Actuator Driver
40 Actuator
28 Control Circuit
29 Reversion System
26 Driver
27 Format Generator

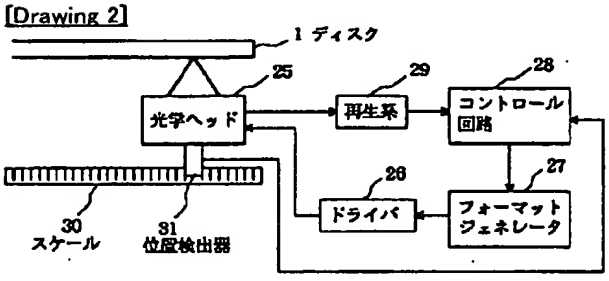
[Translation done.]

DRAWINGS

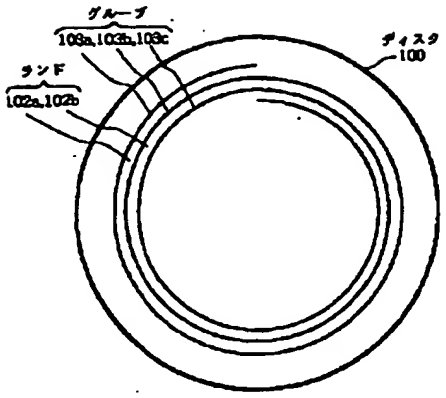
[Drawing 1]



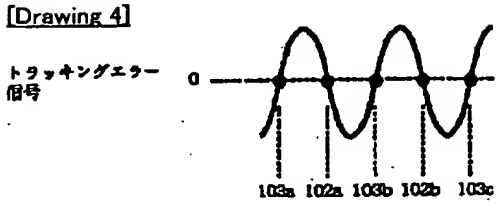
[Drawing 2]



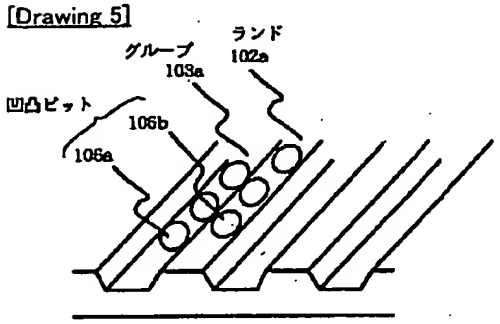
[Drawing 3]



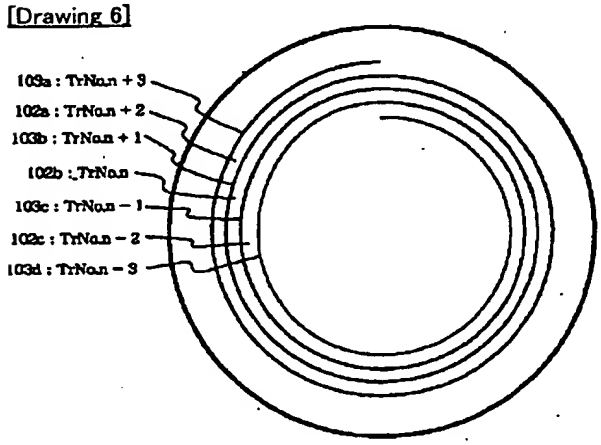
[Drawing 4]



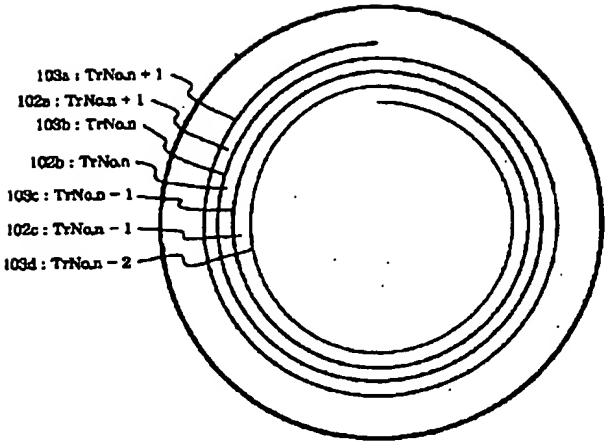
[Drawing 5]



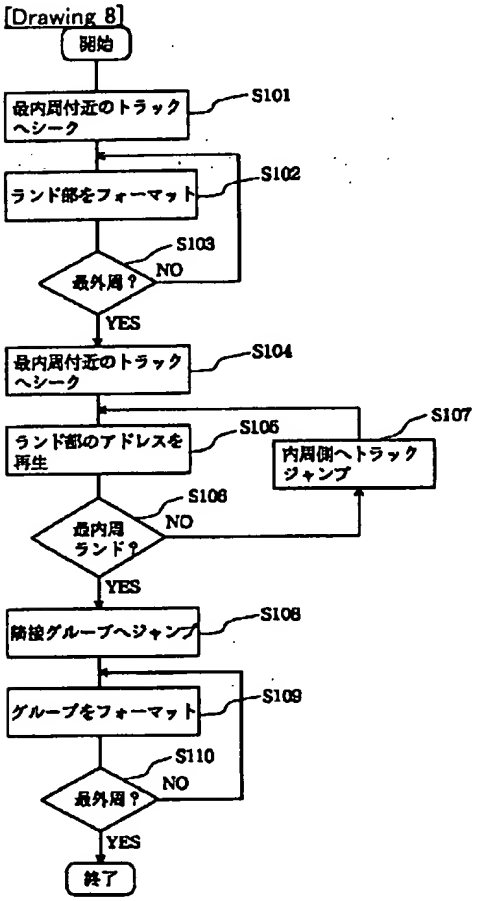
[Drawing 6]



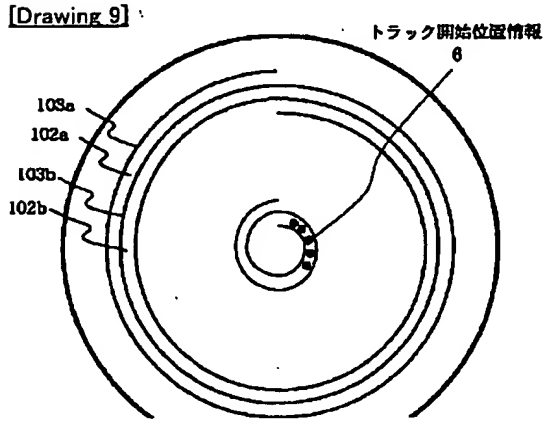
[Drawing 7]



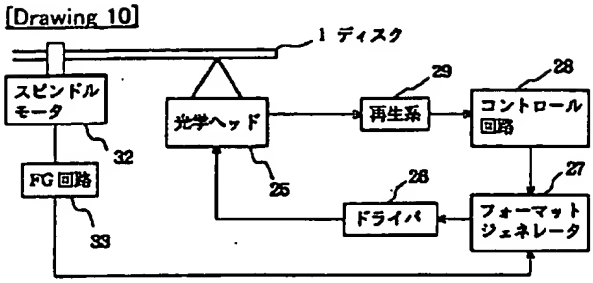
[Drawing 8]



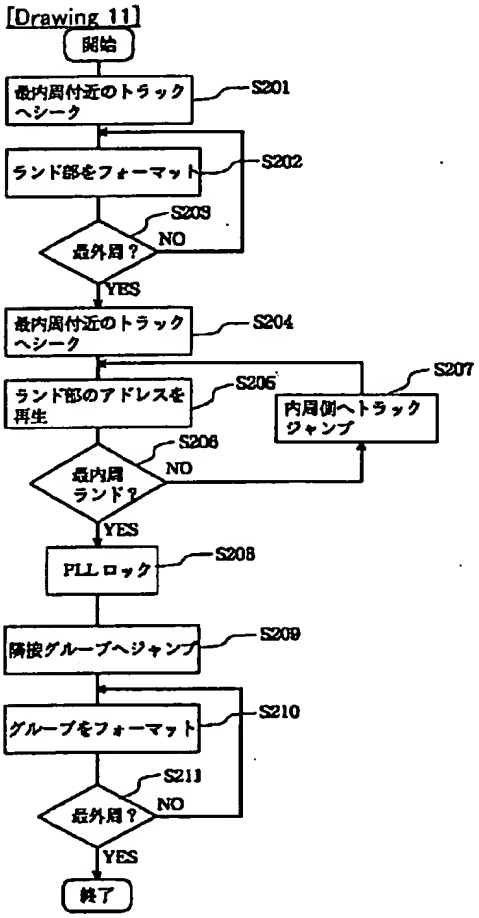
[Drawing 9]



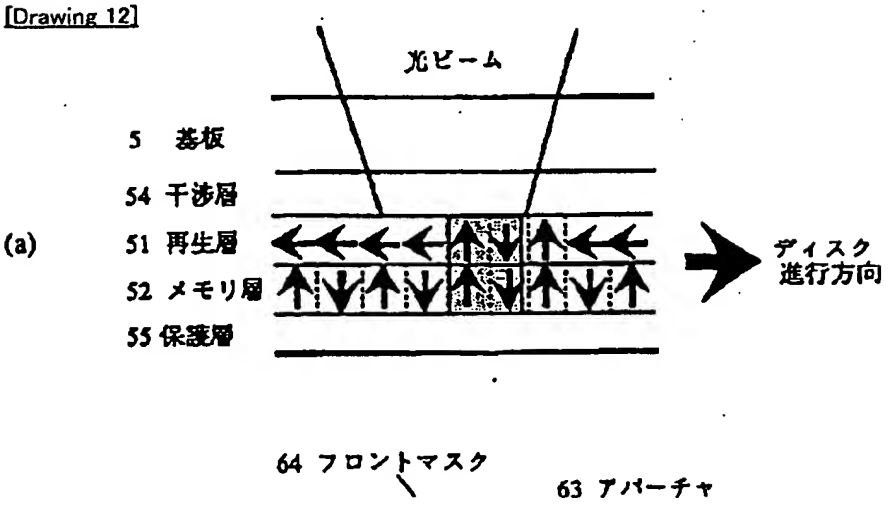
[Drawing 10]

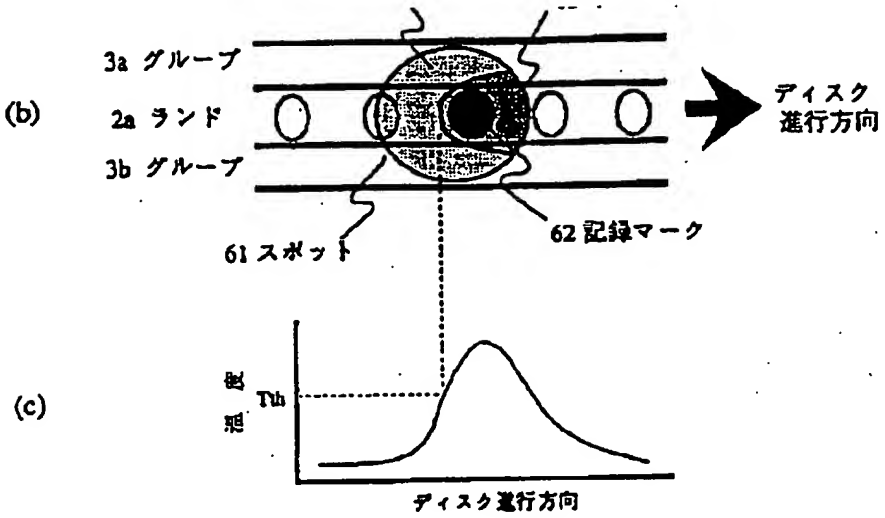


[Drawing 11]

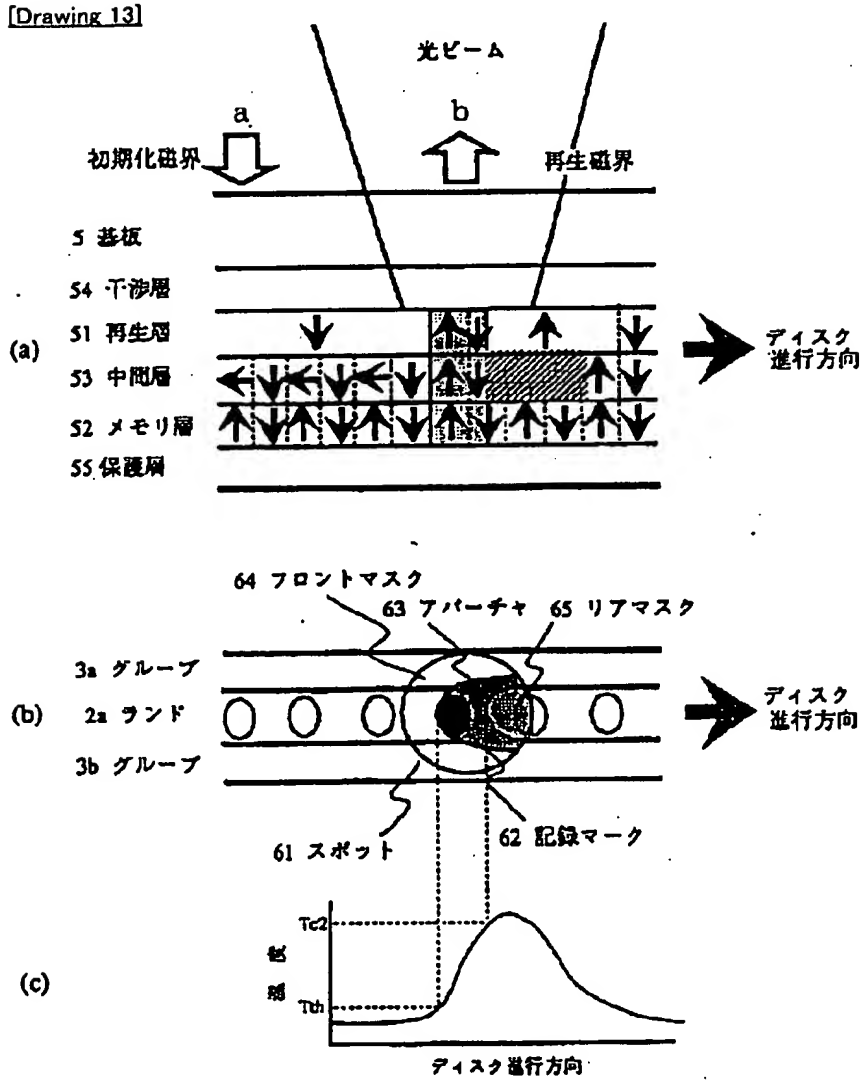


[Drawing 12]





[Drawing 13]



[Translation done.]